ARROYO
GEOTECHNICAL

1515 South Sunkist Street, Suite E
Anaheim, California 92806
714/634-3318 fax 714/634-3372
www.arroyogeotechnical.com

January 10, 2006

Mr. Edgar Pejoro
Regency Centers
915 Wilshire Blvd., Suite 2200
Los Angeles, California 90071

Subject: **Engineering Geology Report**
Proposed Shopping Center
3759-3763 State Street
Santa Barbara, California
Arroyo Geotechnical Project No. 15555-2000

Reference: **Report of Geotechnical Investigation and Seismic Hazard Evaluation Study**
Proposed Shopping Center, 3759-3763 State Street, Santa Barbara, California
Report Dated May 6, 2005, Arroyo Geotechnical Project No.: 12184-2000

1.0 INTRODUCTION

1.1 PURPOSE

Arroyo Geotechnical has prepared the present engineering geology report in response to comment E.1 Building & Safety Division from The City of Santa Barbara, dated December 6, 2005. This report is an addendum to the Report of Geotechnical Investigation and Seismic Hazard Evaluation Study prepared by this Company for the proposed shopping center under consideration and issued on May 6, 2005 (Arroyo, 2005).

2.0 GEOLOGIC SETTING

2.1 REGIONAL GEOLOGY

Minor, et al, 2003, provide an excellent summary of the regional geologic, structural and compressional deformation that occur in the Santa Barbara Area. Therefore, the regional information presented below was derived mainly from that source.

The proposed shopping center (Site) is located in the Santa Barbara Coastal plain, just south of the Santa Ynez Mountains. The Santa Barbara coastal plain is located in the western Transverse Ranges physiographic province along a west-trending segment of the southern California coastline (CDMG, 1997). The Transverse Ranges are a geomorphic unit characterized by east-west trending faults, folds, mountain ranges, and valleys. The Coastal Plain is composed of uplifted and dissected marine terraces, hill, and valleys, some of which form estuaries and lagoons.

The coastal plain region, which extends from the Santa Ynez Mountains on the north to the Santa Barbara Channel on the south, is underlain by numerous active and potentially active folds and partly buried thrust faults of the Santa Barbara fold and fault belt. The oldest stratigraphic units in the general area of Santa Barbara consist of resistant Eocene to Oligocene marine and terrestrial sedimentary rocks that form a mostly southward-dipping and laterally continuous sequence along the south flank of the Santa Ynez Mountains. Less resistant, but more variably deformed, Oligocene, Miocene, Pliocene, and Pleistocene marine sedimentary rocks and deposits are exposed in the lower Santa Ynez foothills and in the coastal hills and sea cliffs located farther south. Pleistocene and Holocene surficial alluvial, colluvial, estuarine, and marine-terrace deposits directly underlie much of the low-lying coastal plain area, and similar-aged alluvial and landslide deposits locally mantle the lower flanks of the Santa Ynez Mountains (Minor, et al, 2003; Figure 3).

Structurally, the Santa Barbara coastal plain area is dominated by the Santa Barbara fold and fault belt, an east-west-trending zone of Quaternary, partly active folds and blind and exposed reverse and thrust faults. The dominant trend of individual structures within the belt is west-northwest – slightly oblique to the overall trend of the fold and fault belt. A conspicuous exception, however, is the More Ranch fault system, which strikes east-northeast across the fold and fault belt at a high angle to the dominant structural grain. Based on a limited number of observations made at rare fault-plane exposures, most of the map-scale faults in the coastal plain area are moderately to steeply dipping and have most recently experienced reverse or reverse-oblique slip. Multiple sets of slip lineations, including strike-slip and, rarely, normal-slip striae, are commonly preserved on the fault planes, however, indicating that many of the faults have a varied, complex movement history (Minor, et al, 2003).

Several folds within older alluvial deposits have strong geomorphic expression that is consistent with a youthful age of deformation; commonly anticlines are coincident with elongate ridges or hills whereas synclines coincide with valleys or swales. The most dramatic example of such a geomorphic-structural correlation is Mission Ridge just north of downtown Santa Barbara, which is coincident with an anticline that is paired on its north side with a syncline that roughly follows a linear valley. On the basis of several lines of geomorphic evidence previous investigators have inferred that the Mission Ridge upwarp is a fault-related fold that has propagated westward, reflecting westward propagation of the Mission Ridge fault and resulting in progressive westward deflection of Mission Creek. Several folds in the map area, including the Mission Ridge anticlinal upwarp and folds just west of the Santa Barbara Harbor, are inferred to be underlain by blind reverse and thrust faults. Other fold axes on the coastal plain are parallel to adjacent fault traces, and in such cases the fold on the apparent upthrown, hanging-wall side of the fault is typically an asymmetric anticline whose steeper limb faces the fault. Nearly all asymmetric anticlines in the map area have northward vergence, suggesting that most associated blind reverse-thrust faults are dominantly southward dipping similar to the exposed faults and, thus, have accommodated northward tectonic transport of their hanging-wall blocks. Such structural geometry is consistent with fault-propagation folding and, together with evidence of dominant reverse fault slip, implies that faults in the Santa Barbara area have accommodated significant contractional strain during the Pleistocene (Minor, et al, 2003).

An erosional angular unconformity that separates the Sisquoc Formation and older units from the Santa Barbara Formation and partly coeval deposits suggests that significant uplift and deformation occurred in the coastal area in the Pliocene. One or more of these earlier deformational episodes may have been coeval with the formation of numerous northwest- trending folds and faults in the Monterey Formation along the sea cliffs between Santa Barbara Point and Arroyo Burro; these structures clearly predate unconformably overlying, cliff-capping marine terrace deposits. Possible age-equivalent folds also deform the Monterey Formation in Sycamore Canyon area in the east part of the map area. The late Pleistocene marine terrace deposits, although uplifted and locally warped or gently folded, are clearly not as strongly deformed as the older Pleistocene deposits and underlying bedrock, and no significant deformation has been recognized in the mapped Holocene deposits despite the historic earthquake activity in the region. Collectively, these various structural age relations imply that deformation in the coastal plain area was most pronounced during the Pliocene and (or) Pleistocene prior to formation of the marine terraces in the late Pleistocene.

2.2 FAULTING AND SEISMICITY

2.2.1 Faulting

Numerous faults in southern California are categorized as active, potentially active, and inactive. An active fault is defined by the State of California as a "sufficiently active and well defined fault" that has exhibited surface displacement within the Holocene time (approximately the last 11,000 years). A potentially active fault is defined by the State as a fault with a history of movement within Pleistocene time (between 11,000 and 1.6 million years ago). Active and potentially active faults are capable of producing potentially damaging seismic shaking at the site (Hart and Bryant, 1997). In addition, the International Conference of Building Officials (ICBO) has classified active faults as type A, B or C. Such classification depends on the criteria specified in the 1997 Uniform Building Code Table 16-U (considering mainly moment magnitude and slip rate; ICBO, 1998). Type A faults are capable of producing large magnitude events and have a high rate of seismicity [Mmax $\geq$7.0, and slip rate $\geq$ 5 millimeters/year (mm/yr)]. Type C faults are not capable of producing large magnitude earthquakes and have a relatively low rate of seismic activity (Mmax <6.5, and slip rate $\leq$2 mm/yr). Type B faults are all faults other than type A and C.

It is anticipated that the Site will periodically experience ground acceleration as the result of small to moderate magnitude earthquakes. Other active faults without surface expression (blind faults) are also capable of generating earthquakes. Furthermore, other potentially active seismic sources may also be locally present and are not currently zoned nor identified.

While no faults zoned as active by the State of California Geological Survey cross through the Site, several are located nearby. The closest known active faults to the site are the Santa Ynez (West and East) and Red Mountain faults. Potentially active faults such as the Mission Ridge-Arroyo Parida-Santa Ana and the La Mesa-Rincon Creek faults are the closest recognized potentially active faults to the Site and are related to the active folding and thrust faulting that underlie the Santa Barbara Coastal Plain. A California Fault Map showing the geographic relationship of these faults to the Site is presented as Figure 4.

2.2.1.1 Mission Ridge-Arroyo Parida-Santa Ana Fault (More Ranch Fault)

The Mission Ridge-Arroyo Parida-Santa Ana fault, a left lateral with varied vertical slip, makes up an essentially continuous fault system running west to east for approximately 70 kilometers (km) from Goleta to Ojai, on the southern flank of the Santa Ynez Mountains. The fault forms a series of hills including those east of Sycamore Canyon, the north side of Mission Ridge, and the small mesa south of State Street between De la Vina Street and Hitchcock Way. The total length of the Mission Ridge-Arroyo Parida-Santa Ana fault includes the More Ranch fault segment.

According with Gurrola and Keller (2003), trench excavations across the Mission Ridge fault exposed 100,000 to 139,000 alluvial fan deposits, probably related to the 125,000 sea level highstand, folded with 90 meters of vertical relief. From this evidence, the authors concluded that a vertical rate of deformation of 0.75 +/- 0.15 millimeters per year (mm/yr). A trench excavated by Gurrola and Keller (2003) across part of the northern limb of the Mission Ridge anticline exposed fluvial and alluvial sediments that are increasingly tilted with depth. The fluvial units dip approximately 10 degrees to the north and form part of the forelimb of the fold. Radiocarbon analyses of an organic peat horizon yielded an age-date of 1,690 or 1,730 AD years for the fluvial deposits. Based on the arrival of Spanish settlers in 1782, the authors interpreted that an earthquake occurred on the Mission Ridge segment between 1690 A.D. or 1730 A.D and 1,782 AD. Considering that the entire Mission Ridge-Arroyo Parida-Santa Ana fault consists of several segments, their seismic hazard analysis suggested that if only one of the segments ruptured an earthquake of M_w 6.5 would likely result. If all three segments ruptured at the same time, an earthquake of M_w 6.8 to 7.0 would likely occur. However, the approximate slip rate and probable earthquake magnitudes reported by the SCEC (2006) for this fault is 0.37 mm/yr and M_w 6.5 – 7.3, respectively. In addition, the ICBO considers the Mission Ridge-Arroyo Parida-Santa Ana fault as a type B fault with an assigned earthquake of M_w6.7 and a slip rate of 4.0 mm/yr (ICBO, 1998).

The More Ranch fault is considered a segment of the larger Mission Ridge-Arroyo Parida-Santa Ana fault. As a result, this fault and all of its individual segments are considered potentially active. The More Ranch fault segment is the closest fault to the Site and occurs approximately 0.2 km to the south of the southern limit of the proposed shopping center (Minor, et al, 2003; Figure 3). Therefore, the potential for ground surface fault rupture associated with the More Ranch fault on or near the site is considered unlikely.

2.2.1.2 La Mesa-Rincon Creek Fault

According with the Seismic Safety Element for the City of Santa Barbara (1979), the Mesa-Rincon Creek fault, a reverse fault dipping to the south, forms the uplifted "La Mesa" located between the harbor and Arroyo Burro Creek. The fault generally parallels Modoc Road and San Andres Street. The fault is not clearly exposed; however, its location has been inferred, on the basis of water well data and rock exposures in the western portion of the City. In the south downtown area, the fault location is inferred on the basis of possible fault line features that include recurrent sidewalk and street damage, historic hot springs, reported railroad track displacement, and small anomalous topographic mounds or possible scarps. The Mesa-Rincon Creek fault can be traced southeastward from its intersection with the More Ranch fault segment of the Mission Ridge-Arroyo Parida-Santa Ana fault for approximately four miles. It is inferred that the fault extends into the sea slightly south of Stearns Wharf, near the Veterans Hall. At this location the railroad tracks were reportedly severed during the 1925 earthquake. The Mesa fault appears to join the Offshore Barrier fault, and eventually joins the Rincon Creek fault in Carpinteria for an approximately total length of 32 km (SCEC, 2006).

The La Mesa-Rincon Creek fault is considered potentially active, exhibiting some characteristics of activity such as possible railroad track displacement. The slip rate and probable magnitude assigned to this fault by the SCEC (2006) is approximately 0.3 mm/yr and M_w6.0-7.0, respectively. No seismic events have been instrumentally recorded on the La Mesa fault. However, this fault may have been responsible for any of the several notable earthquakes in the Santa Barbara area since records have been kept. The 1925, 1941, and 1978 earthquakes, however, occurred on active offshore fault(s) (probably the Red Mountain and/or Pitas Point faults), and offshore geologic data suggest a structural relationship between the Red Mountain fault and the La Mesa-Rincon Creek fault. Future movement on the La Mesa fault is expected to be sympathetically related to a major event on the Red Mountain Thrust fault, rather than generated from the La Mesa fault itself (City of Santa Barbara, 1979).

The ICBO did not considered the La Mesa-Rincon Creek fault in its map of known active faults (ICBO, 1998). The La Mesa fault occurs approximately 0.55 km to the southwest of the southwestern corner of the Site.

2.2.1.3 Santa Ynez Fault

Tectonic structures within the western Transverse Ranges are mainly east-west striking faults and folds. Most of these faults exhibit reverse and some left-lateral strike-slip displacement and many are currently active. The Santa Ynez fault, a left-reverse geologic feature, is one of the largest structures (at least 130 km in length) in the western Transverse Ranges and has lifted the Santa Ynez and Topatopa ranges during late Cenozoic time to elevations of more than 2,000 meters. The Santa Ynez fault dips to the south. Dibblee (1987) reports vertical displacement to the north of several miles. This fault is reported to die out at each end in folded Miocene formations.

The most recent surface rupture reported for this fault by the SCEC (2006) is late Quaternary, except for a short segment near the intersection with the Baseline fault, which is Holocene in age. The corresponding slip rate and probable earthquake magnitude assigned by the SCEC (2006) is 0.1 to 0.7 mm/yr and Mw6.5-7.5, respectively. In addition, the ICBO considers the Santa Ynez fault to be a type B fault with a slip rate of 2.0 mm/yr and an earthquake of M_w 6.9-7.0 (ICBO, 1998). The western segment of the Santa Ynez fault is located approximately 7.8 km to the north of the Site.

2.2.1.4 Red Mountain Fault

According with the SCEC (2006), the surface trace of the Red Mountain fault is so greatly "bent" that it hardly suggests a planar structure, unlike the nearly-linear traces of many strike-slip faults. This winding surface trace is a characteristic typical of thrust faults. It arises from the intersection of a low-angle (to the horizontal) fault plane with the local topography. It has been suggested that the dip of the Red Mountain fault gets progressively shallower with depth, until it becomes a horizontal fault, an unusual and still theoretical structure. The Red Mountain fault splays into two main branches near the Carpinteria coast. The northern branch decreases in displacement to the west and continues as far west as offshore Goleta where it may die into folding. The south branch decreases in displacement to the west and dies out in a syncline south of Santa Barbara.

The reported dip of this fault is to the north. At its northeastern end, the Red Mountain fault seems to be cut off by the small but recently active Oak View fault. The southern branch of the "fork" at its western end is known as the Javon Canyon fault, and has a slip rate of approximately 1.1 mm/yr.

The most recent surface rupture reported for this fault by the SCEC (2006) is Holocene to late Quaternary. The corresponding slip rate and probable earthquake magnitude assigned by the SCEC (2006) is 0.4 to 1.5 mm/yr and Mw6.0-6.8, respectively. In addition, the ICBO considers the Red Mountain fault to be a type B fault with a slip rate of 2.0 mm/yr and an earthquake of M_w6.8 (ICBO, 1998). The Red Mountain fault is located approximately 8.6 km to the southeast of the Site.

2.2.2 Historical Earthquakes

The area is subject to periodic strong seismic shaking. According with the City of Santa Barbara (1979), major earthquakes occurred in 1812 in the Santa Barbara Channel, while the 1927 magnitude (M_L) 7.5 Lompoc earthquake occurred approximately 130 km offshore and west of Santa Barbara. The 1850 M_L8.0 Fort Tejon Earthquake is the largest historic earthquake reported in the region, and while strongly felt it did only minor damage. In addition to these major earthquakes, four strong earthquakes between M_L5.9 and M_L6.8 were reported in 1925, 1941, 1973, and 1978. Although not considered major earthquakes, the 1925 and 1978 earthquakes did considerable damage, some of which is recorded in the Catalog of Santa Barbara Earthquakes.

3.0 SITE GEOLOGY AND GROUNDWATER CONDITIONS

3.1 SITE GEOLOGY

Topographically, the site lies at an approximate elevation of 200 feet above mean sea level (amsl) on a nearly flat surface that gently grades down to the southwest. Drainage in the site area is presently controlled by storm run-off sewers and street drainage that empties into the San Roque Creek or Barger Canyon Creek, which are part of the Arroyo Burro Drainage that discharges into the Santa Barbara Channel (Figure 1 of the referenced Arroyo Geotechnical, 2005 Report).

The Site is located in the Santa Barbara Coastal plain and it is underlain by alluvial and colluvial materials of Holocene and late Pleistocene age (Figure 3; Minor, et al, 2003). These unconsolidated to weakly consolidated silt, sand, and gravel deposits of modern drainages, alluvial fans, and floodplains are inferred to underlie much of the Goleta-Santa Barbara Urban area. Where exposed, the alluvial materials are reported to consist of poorly to moderately sorted silt, sand, and pebble to boulder gravel traversed by narrow and small channels. Flanking colluvial deposits are reported to be composed of primarily poorly sorted, angular clasts in a fine-grained matrix derived from weathering of bedrock and transported directly downslope.

Based on the 19 exploratory soil borings advanced by Arroyo Geotechnical as part of this investigation, and on the 7 soil borings drilled by Leighton Consulting in 2004 at the Site, the subsurface soils consist predominantly of silty clay and sandy silt interbedded with silty sand at various depths and with various thicknesses. Figure 2 of the Arroyo Geotechnical report (2005) presents the approximate locations for all field investigations performed during the current and past events of exploration at the Site. As a result, the exploratory soil borings advanced at the Site, to a maximum depth 51.5 feet below ground surface (bgs), confirm that the Site is underlain by alluvial materials.

3.2 SITE GROUNDWATER CONDITIONS

Groundwater occurrence at the Campus was encountered in eight (8) of the nineteen (19) geotechnical soil borings advanced by Arroyo Geotechnical (2005) and on five (5) of the seven (7) soil borings drilled by Leighton (2004). As a result, depth to groundwater was measured at 29 to 30 and 19 to 32 feet bgs during April 2005 and April 2004, respectively.

4.0 OTHER SEISMIC HAZARDS

The seismic hazards may be primary, such as surface rupture and/or ground shaking, or secondary, such as landsliding, liquefaction, dynamic settlement, flooding, seiches, and/or tsunamis.

4.1 LIQUEFACTION

The liquefaction hazard at the Site was determined by Arroyo Geotechnical (2005). Please refer to that report for details.

4.2 SEISMICALLY INDUCED SETTLEMENT

Settlement generally occurs within areas of loose, unsaturated, granular soils with relatively low densities. The possibility of seismically induced settlement at the site is addressed in the Arroyo Geotechnical (2005) report.

4.3 TSUNAMIS, INUNDATION AND SEICHES

The site is located approximately 3 miles inland from the Pacific Ocean at an approximate elevation of 200 feet amsl. Therefore, tsunamis (tidal waves generated by fault displacement or severe ground movement) are not considered a hazard at the site.

Due to the absence of a confined body of water in the immediate vicinity of the project site, the possibility of seismically induced flooding or seiches is considered low.

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4.4 GROUND SURFACE RUPTURE

Ground surface displacement along a fault, although more limited in area than the ground shaking associated with it, can have disastrous consequences when structures are located straddling the fault or near the fault zone. Fault displacement involves forces so great that it is not practically feasible (structurally or economically) to design and build structures to accommodate rapid displacement and remain intact. Amounts of movement during a single earthquake can range from several inches to tens of feet. Another aspect of fault displacement comes not from the violent movement associated with earthquakes, but the barely perceptible movement along a fault called "fault creep." Damage by fault creep is usually expressed by the rupture or bending of buildings, fences, railroads, streets, pipelines, curbs, and other such linear features.

No faulting was observed during our field investigation. In addition, active, potentially active, and other major inactive faults noted on regional geologic and fault maps do not cross nor project toward the site. Furthermore, the site is not located within any Alquist-Priolo Earthquake Fault Zone Maps as designated by the California Geological Survey (Hart and Bryant, 1997, and CGS, 2006). In addition, Minor, et al (2003) and ICBO (1998) indicate that the closest active fault to the Site is the Santa Ynez fault located approximately 7.6 km to the north, whereas the closest potentially active fault is the More Ranch fault segment of the Mission Ridge-Arroyo Parida-Santa Ana fault located approximately 0.2 km to the south of the southernmost limit of the Site. Therefore, the possibility of any hazard due to ground surface rupture or fault offset at the Site is considered unlikely.

4.5 LANDSLIDES

The relatively flat-lying topography at the site and surrounding area precludes unstable slope conditions and the potential for lurching (earth movement at right angles to a cliff or steep slope during ground shaking). There are no known landslides near the site, nor is the site in the path of any known or potential landslides.

5.0 REFERENCES

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6.0 CLOSURE

Based on findings of this report and stability analyses of the creek banks presented in the referenced report (Arroyo 2005), it is our conclusion that the proposed development satisfies the concerns of the Santa Barbara Municipal Code 28.87.250 as it relates to the proposed development. In addition, we thrust that the present engineering geology report meets your requirements. The site is a flat property underlain by Alluvium and the reported active Fault is sufficient distance away from the site, therefore it is our opinion that preparation of a geologic cross section and trenching is not warranted for this project. Please do not hesitate to contact this office with any questions/comments that you may have.

Respectfully submitted,

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Ramon Chavez, PG, CEG, CHG
Principal Geologist
CEG 1599 Expires 04-30-07

CERTIFIED ENGINEERING GEOLOGIST RAMON CHAVEZ No. 1599 Exp. STATE OF CALIFORNIA

Ross Khiabani, PE, GE
Principal Engineer
PE 37156, GE 2202 Expire 06-30-06

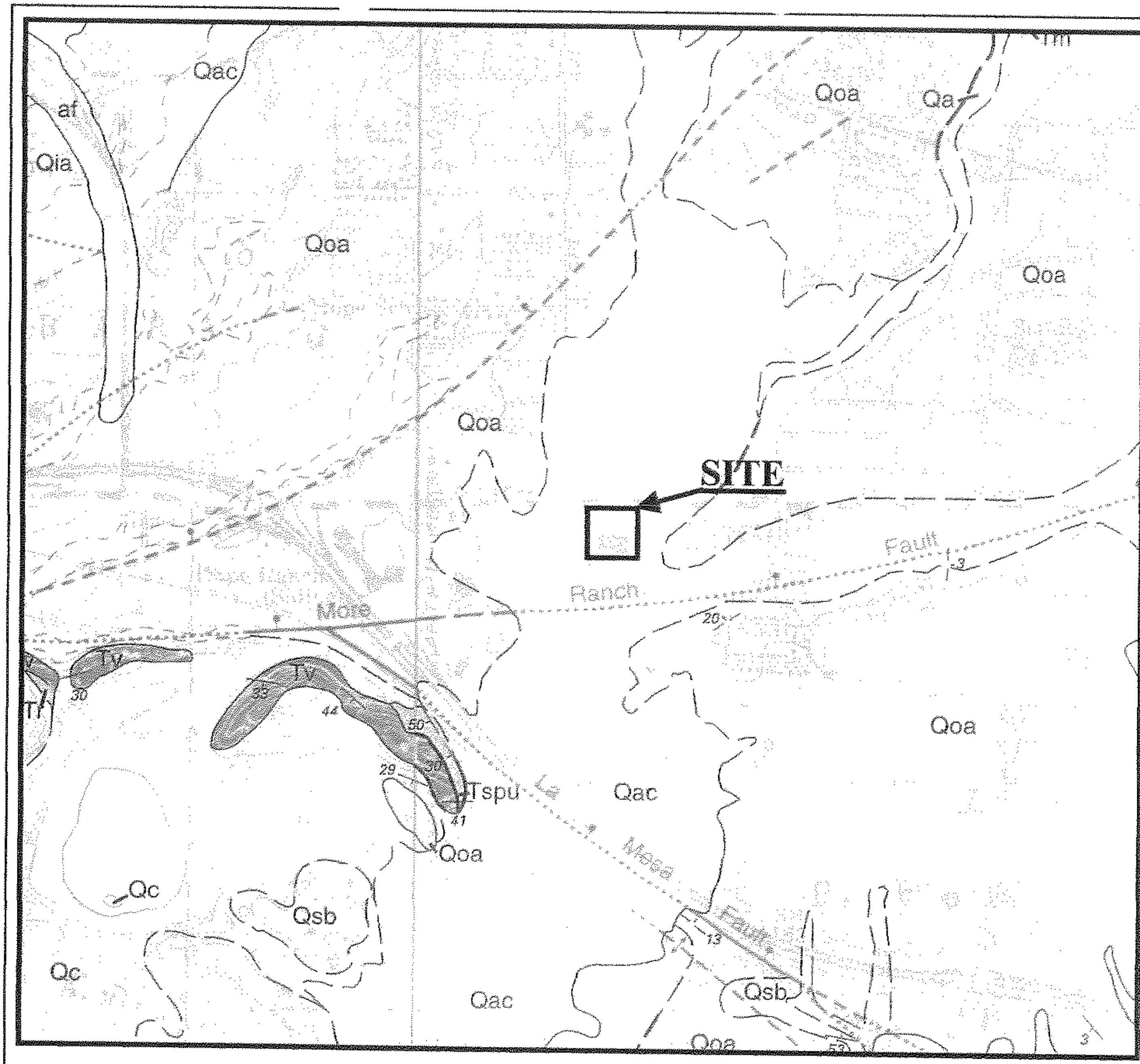
REGISTERED PROFESSIONAL ENGINEER ROSS KHIABANI No. 2202 Exp. 6-30-06 GEOTECHNICAL STATE OF CALIFORNIA

Attachments:

- Figure 1 Regional Geologic Map
- Figure 2 Regional Fault Map

Distribution:

1) Addressee
3) Dudek & Associates, In.
   Attention: Ms. April Verbanac



EXPLANATION

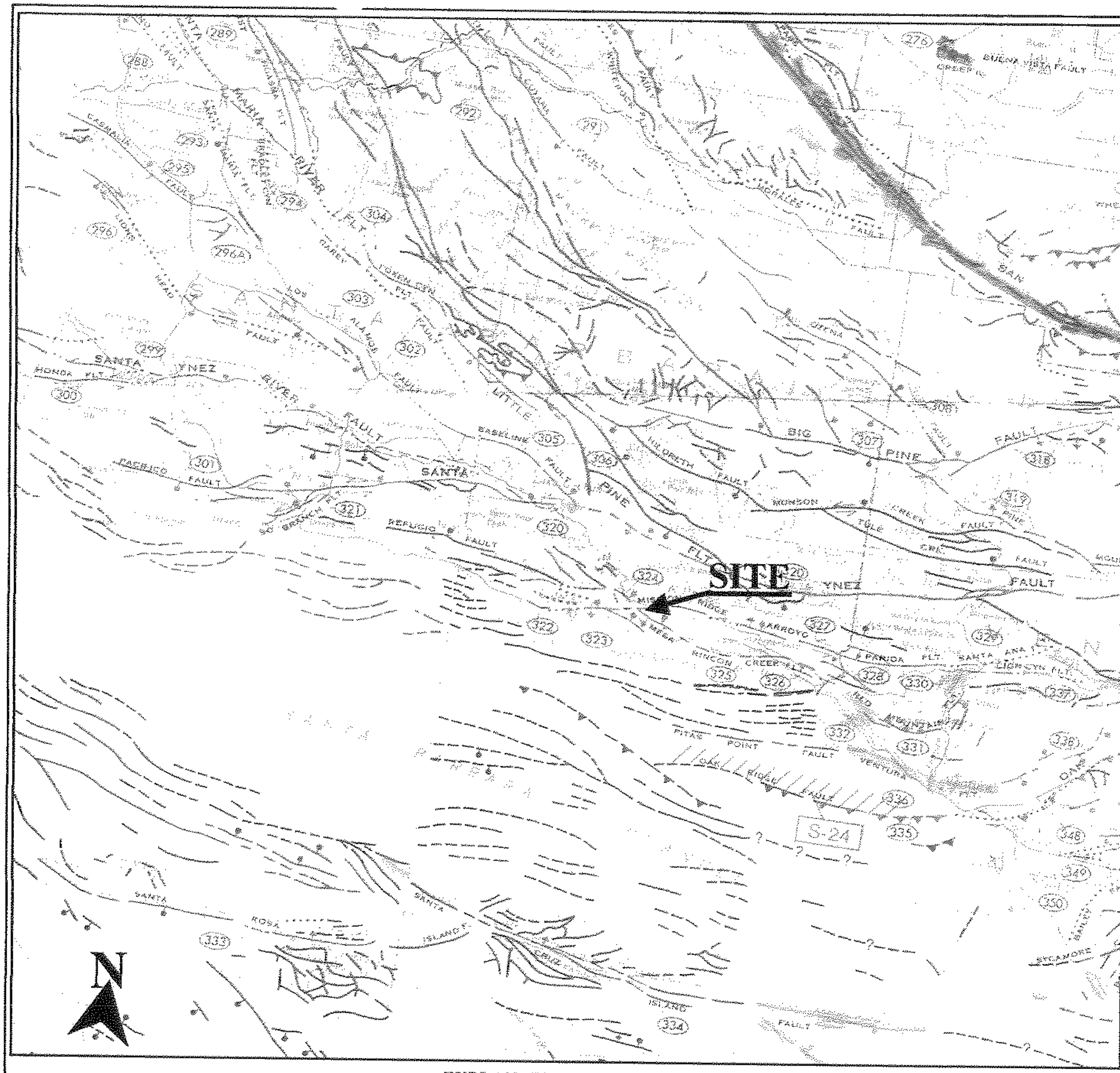
Qac	Alluvium and colluvium (Holocene and upper Pleistocene)
Qc	Colluvium (Holocene and upper Pleistocene)
Qoa	Older alluvial deposits (upper and middle Pleistocene)
Qsb	Santa Barbara Formation (middle Pleistocene)
Tv	Vaqueros Formation (upper Oligocene)

N

SCALE : APPROXIMATELY 1 INCH EQUALS 1,300 FEET

Source: Minor, A. S., et al, 2003, Preliminary Geologic Map of the Santa Barbara Coastal Plain Area, Santa Barbara County, California: United States Geological Survey, Open File Report 02-136, Digital Version 1.1.

ARROYO GEOTECHNICAL	REGIONAL GEOLOGIC MAP 3759 - 3763 State Street, Santa Barbara, California	FIGURE 1



EXPLANATION

Fault along which historic (last 200 years) displacement has occurred.

Holocene fault displacement (during past 10,000 years).

Late Quaternary fault displacement (during past 700,000 years).

Quaternary fault (age undifferentiated).

Late Cenozoic faults within the Sierra Nevada.

Pre-Quaternary fault (older than 1.6 million years) or fault without recognized Quaternary displacement.

Pink band added to emphasize location of historic fault displacement.

Approximate Scale 1 Inch Equals 10.89 Miles

Source: Jennings, C.W., 1994, Fault Activity map of California and Adjacent Areas with Location and Ages of Recent Volcanic Eruptions: California Division of Mines and Geology, Geologic Data Map Series, Map No. 6, Scale 1 : 750,000.

ARROYO GEOTECHNICAL	REGIONAL FAULT MAP 3759 - 3763 State Street, Santa Barbara, California	FIGURE **2**